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Archives

Short Winter Course in
Agriculture Dairying

Maryland Agricultural College Bulletin

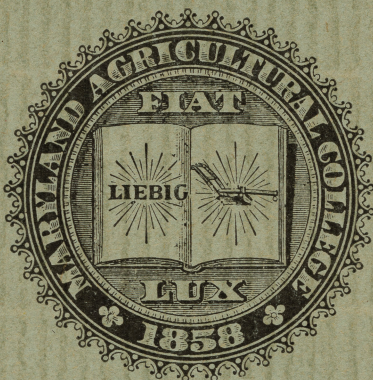
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Vol. 1

No. 2

THE MARYLAND AGRICULTURAL COLLEGE

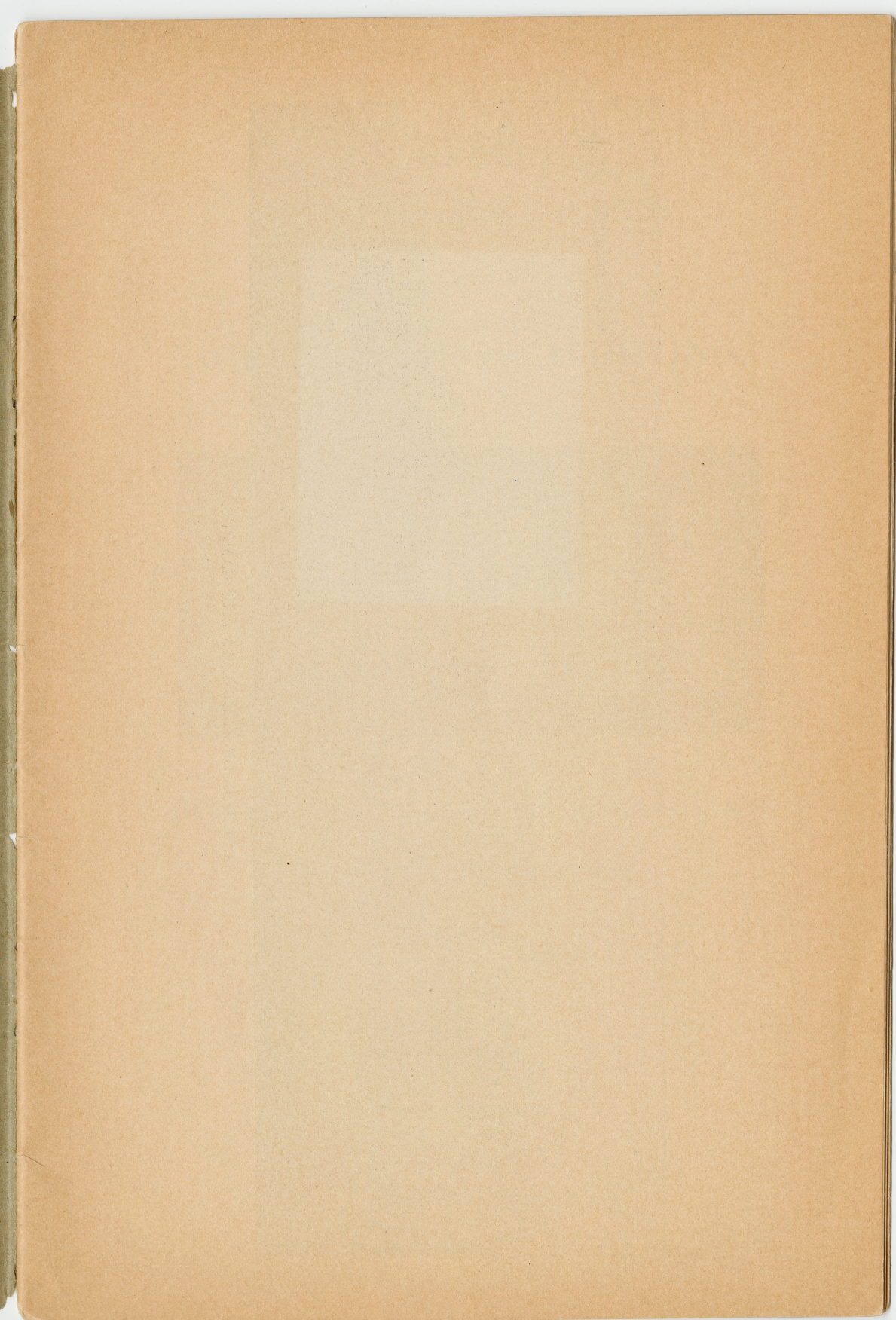


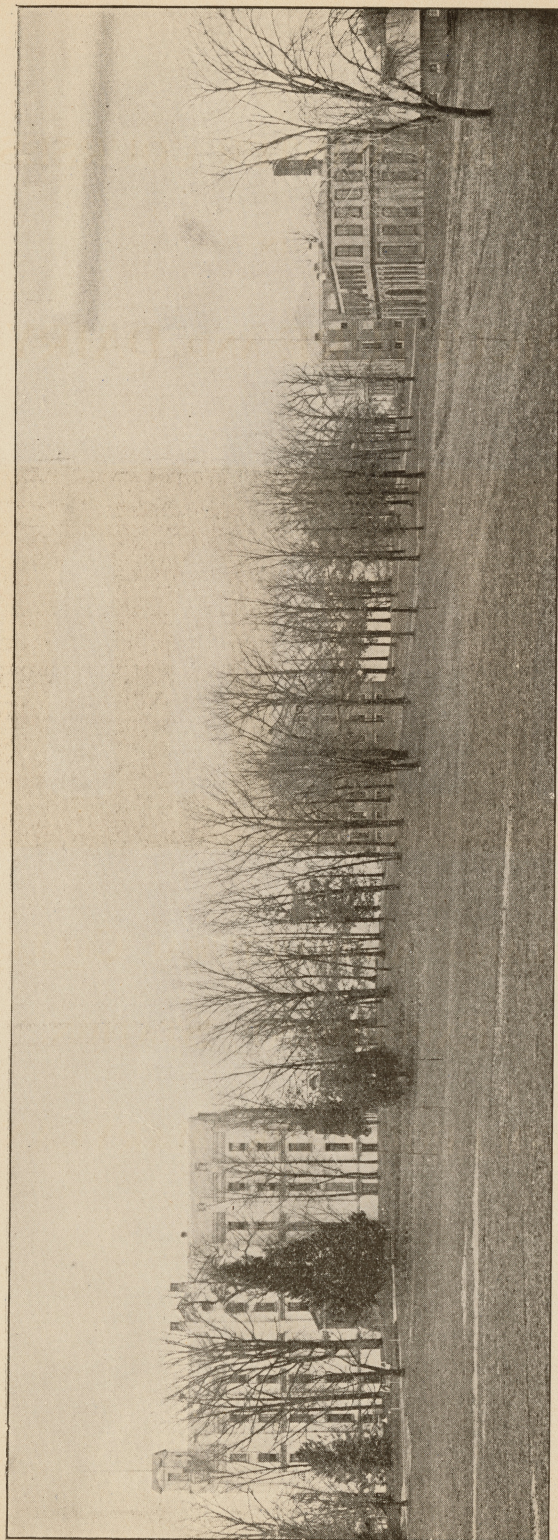
COLLEGE PARK, MARYLAND

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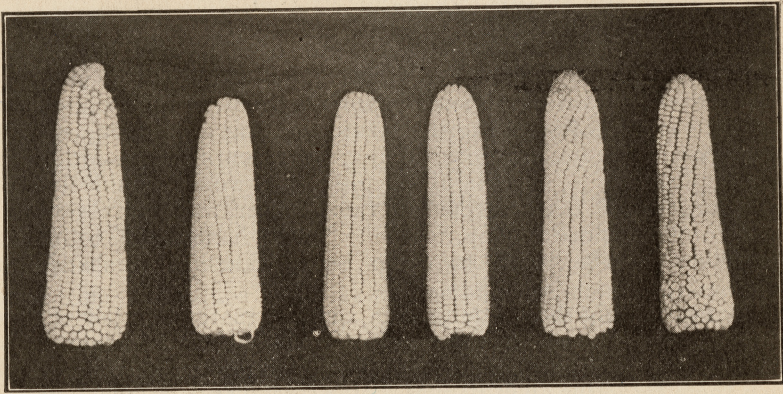
PORTION OF BUILDINGS AND CAMPUS.

Maryland University

SHORT WINTER COURSES

— IN —

AGRICULTURE AND DAIRYING.

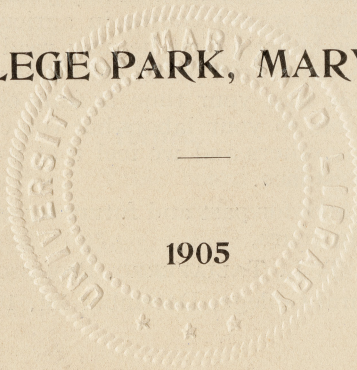


MARYLAND AGRICULTURAL COLLEGE AND

EXPERIMENT STATION,

COLLEGE PARK, MARYLAND.

—
1905



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To the Teachers of Maryland.

DEAR FRIENDS:

I have several times, in the past, called on you for assistance in reaching young men to whose attention we desired to bring the opportunities offered them by our ten weeks' winter course in agriculture. For the help which has been so freely given I desire now to return my grateful thanks on behalf of myself and the Maryland Agricultural College. I desire, moreover, to put myself and the College under still further obligations to you.

Our short winter course will begin again on the sixteenth day of January, 1905. There are in the State of Maryland hundreds of young men who are engaged in farming, or are about to engage in it, who would find it of immense benefit to them, in their chosen profession to spend a few weeks this winter getting a practical, working knowledge of the underlying principles of scientific agriculture, and their application to successful farming. It would enable them to make larger and better crops, to raise better and more profitable stock, to make more money, to make better homes, and to make of themselves in the years to come better citizens, husbands and fathers.

Unfortunately these young men, or the greater number of them, do not know of the opportunity for improvement offered them at our College nor do we know their names and addresses so that we may reach them by letter or in person. You, good friends, who teach in the country schools know most of the people in your neighborhoods. Will you, not, again help to bring us in touch with young men who need our assistance and whose assistance we need just as much to enable us to do our duty to our State and Country—at once our duty and our highest pleasure—to aid the farmer in his arduous labors and to bring to him, his family and associates in the country more of ease, more of comfort and more opportunity for development.

Will you not, friends, if you know of any young men who might be benefitted by this short winter course in agriculture call it to his attention, lend him this bulletin that he may read the prospectus of it, or even send us his name on a postal card that we may communicate with him? I know that your time is fully occupied. I would not willingly add one iota to your labors but you can help us in this matter better than any others and we feel that we may with confidence rely on your assistance.

With sincerest thanks for past and future favors,
Gratefully yours,

W. T. L. TALIAFERRO, Professor of Agriculture.
Maryland Agricultural College, December 1st, 1904.

SHORT COURSES.

THE experience of the most progressive and successful agricultural States has absolutely demonstrated two facts. First, that in this day of close competition and low prices, a farmer, in order to be successful, must practice scientific methods in handling his crops and stock; and second, that the place for the farmer to learn scientific methods is at his agricultural college and experiment station.

Fully impressed with the truth of the above facts, the Maryland Agricultural College and Experiment Station present to the farmers of the State the following prospectus of their short courses in Agriculture and Dairying for the winter of 1904-1905.

During the seven years these short courses have been given they have been modified and enlarged, as experience dictated, to suit the needs of the practical farmer and dairyman, and it may be stated with perfect confidence that in no other way can a young man engaged in either of these pursuits so profitably invest a small amount of time and money as in taking one of these short courses.

The attendance on these short courses has been limited heretofore by lack of adequate boarding facilities for the students, but that difficulty has been at least temporarily remedied by the erection of a building specially designed for the accommodation of special course students.

This course will begin on Monday, January 16th, 1905, and will continue ten weeks. It will be open to all young men over 16 years of age. The aim of the course will be to give the largest possible amount of information on strictly agricultural topics, by means of lectures, laboratory instruction and practical work in the field, orchard, greenhouse, stables, creamery and carpenter and blacksmith shops. Students will be required to take not less than two hundred and fifty hours of work.

Terms.

Tuition and room free. Table board will be furnished by the College, at four dollars per week. Students will be expected to furnish their own bedclothes, pillows, towels and napkins and overalls for dairy work. Short course and dairy students are not required to drill or wear uniforms.

SYNOPSIS OF COURSE.



I.—Soils.—Twelve Hours.

Prof. W. T. Taliaferro.

The examination and classification of soils; the relation of soils to water, air, heat; adaptation of soils to crops; improvement of physical condition of soils; drainage, ventilation, cultivation, green manures, cover crops, rotation of crops.

II.—Plant Production.—Ten Hours.

Prof. W. T. L. Taliaferro.

Varieties, improvement, soil requirements, cultivation, planting and harvesting of field crops, including corn, small grains, legumes, grass, silage and soiling crops, potatoes and root crops. Special attention is given to the improvement of farm crops by systematic breeding and selection.

A special feature of this part of the work will be a course in selecting and curing seed corn, in corn seeding and in the breeding of corn for increase in yield and feeding value.

The results which have already been attained in the improvement of corn by systematic selection and breeding are among the most wonderful, as well as most useful, achievements of modern agricultural science. Corn is already the most valuable crop grown in Maryland, its annual value being about seven million dollars. Large as is this sum, there is no doubt that it would be doubled by a general practice among farmers of correct principles of selecting seed and growing the crop.

This is a valuable and thoroughly practical course, and should not

be missed by any young man who is engaged, or expects to be engaged, in farming in Maryland.



Open Bins for Curing Seed Corn—Maryland Agricultural Experiment Station.

III.—Farm Live Stock.—Eighteen Hours.

Prof. W. T. L. Taliaferro.

Principal breeds of horses, cattle, sheep and hogs; their uses and adaptation; principles and practice of stock breeding; stock judging.

IV.—Stock Feeding.—Ten Hours.

Prof. H. J. Patterson.

The composition and digestibility of the different feeding stuffs, what is meant by a well-balanced ration, and the calculation of such

rations with given materials, feeding for maintenance, fat, butter, eggs, wool, milk; the effect of food on quality; the preservation and preparation of coarse fodders; ensilage; steaming and cooking food, etc., etc. Not only will the theory be studied, but a careful carrying out of the theory in practice will be the features of the course.

V.—Tobacco.—Five Hours.

Prof. H. J. Patterson.

The plant bed, culture, harvesting, curing, marketing, and effects of fertilizing elements upon the quality.

VI.—Manures.—Twenty Hours.

Dr. H. B. McDonnell.

The best methods of preserving and applying farm manure. The relative value of the different manures and fertilizers. The maintenance of soil fertility. The place of lime in the farm economy.

VII.—Agricultural Chemistry.—Twenty Hours.

Dr. H. B. McDonnell and Mr. Foster.

Soils; their formation, classification and properties. The mineral constituents of soils and their bearing on plant growth. The best means of supplementing them when needed for plant growth.

VIII.—Dairying—Forty Hours

Prof. C. F. Doane.

The dairy instruction will consist of lectures on bacteriology, and the necessary precautions to insure a good product; lectures on the obtaining of cream from the milk, comparing the old gravity process and the use of separators; on milk testing with the Babcock test, and the place of the test in modern dairying, and on butter making with the use of the acid test, which practically insures the making of good butter. The lectures on milk testing and butter making will be supplemented by practical instruction, and each student will be required to handle the Babcock test as well as the separator and the churn.

IX.—Veterinary Science—Twenty Hours.

Sam'l S. Buckley, D. V. S.

Digestion of food under normal conditions.
Results of faulty conditions in feeding stock.

Disorders and diseases of digestive tract, and correction of the same.

The use of medicines and performance of operations in emergency cases among animals by the non-professional.

Bandages, and method of applying them.

Method of detecting lameness and treating certain forms of lameness.

Points on the examination of horses before purchase.

Cattle, and some of their disorders.

Infectious diseases, and how to deal with them. The limited time for the course will necessitate a brief consideration of each subject, but it is hoped to place the matter before students in such a way as to be of practical benefit in the care of live stock.

X—Carpentry and Blacksmithing.—Fifty-five Hours.

Prof. J. H. Mitchell and Mr. Blandford.

A knowledge of this is very important to the agriculturist of this day. The equipment for this instruction is complete. The industrious, eager seeker after knowledge will accomplish much in the line of this work in the time allotted.

1. Sharpening of tools.
2. Adjustment of tools.
3. Sawing, Planing, Chiseling and Boring.

Practical Lessons in Blacksmithing.—Mechanism of, and care of forge and smith's tools. Preparation of forge for fire. Building and managing the fire and fluxes. Forging, bending, welding.

XI.—Plant Physiology and Pathology.—Fifteen Hours..

Prof. J. B. S. Norton.



Making Bordeaux Mixture.

Five lectures on the general principles of plant life and structure; how plants live, grow and reproduce, and how they are influenced by different conditions of light, temperature, moisture and other factors in their surroundings; considered with special reference to agricultural problems. Five lectures on the causes, symptoms and treatment of plant diseases, with practice work in examination, and study of diseased plants, and the preparation and use of remedies and preventatives.

This course will include the discussion of the laws of plant life, the uses and structure of plant parts, nutrition, growth, formation of products by the plant, reproduction by seeds and otherwise, seed testing, useful plants, weeds, poisonous plants, geographical distribution, variation, acclimatization, cause of diseases, parasitic fungi, preparation of fungicides and spraying.

XII.—Horticulture—Thirty Hours.

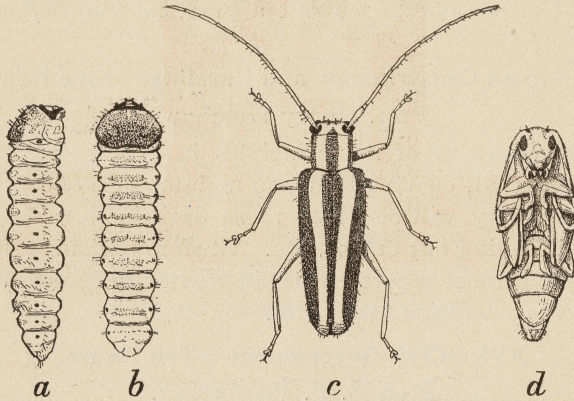
Prof. W. N. Hutt.

A discussion of the fundamental principles of fruit and vegetable growing, orchard cultivation, fertilization, pruning, grafting, packing and marketing of fruits. The construction and management of hotbeds, cold frames and the propagation of plants. These lectures will be supplemented by practical work in green houses and orchards.

XIII.—Economic Entomology—Twenty Hours.

Prof. Thos. B. Symons.

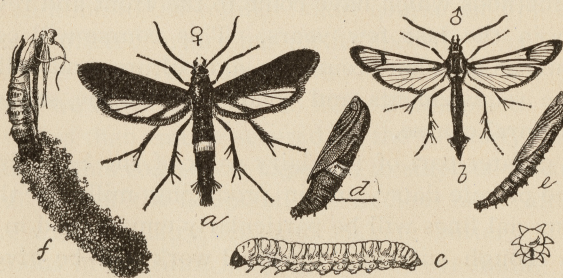
These lectures will treat of the characters of insects in their rela-



The Round Headed Apple Tree Borer. a, larva from side; b, from above; c, female; d, pupa; all enlarged one-third. (After Chittenden, Cir. No. 32, S. S. Div. Ent. U. S. Dep't of Agri.)

tion to the methods of combating them, together with concise considerations of the life history and habits of some of the more important insects with which the farmer and fruit grower have to deal.

Attention will also be given to the making and application of insecticides.



The Peach Tree Borer. a, adult female; b, adult male; c, full grown larva; d, female pupa; e, male pupa; f, pupa skin extended partially from cocoon; all natural size (after Marlatt, Cir. No. 17, S. S. Div. Ent. U. S. Dept. Agri.).

XIV.—Farm Accounts.—Twelve Hours.

Prof. H. T. Harrison.

A simple, concise and accurate method of keeping farm accounts. Business methods are as necessary to the successful farmer as to the merchant. Neither can do without a practical knowledge of book-keeping.

XV.—Road Construction and Leveling.—Five Hours.

Prof. Henry Lanahan.

A brief treatment of the principles involved, and the methods used in the location, construction and maintenance of country roads.

An opportunity will be given those desiring it to learn the use of the level in laying out drains, etc. Students wishing to take the work in leveling must report to the instructor in charge within two weeks after the opening of the term.

XVI.—Civil Government.—Ten Hours.

Prof. F. B. Bomberger.

The general principles of government; the rights and duties of citizens, and an inquiry into the political institutions of Maryland.

SHORT COURSE IN DAIRYING.

Prof. Chas. F. Doane.

There are a great many boys who expect to engage principally in dairying as a life work. For such the College has provided a short course in dairying. Dairymen of the present day need instruction in the new methods which have come to the front and revolutionized the industry in the last few years. This course will commence at the same time as the short course in agriculture, and will last eight weeks. The requirements and conditions are the same as for the short agricultural course.

As the greater part of the dairy work of the State is in making butter in the private dairy, and in producing milk for the city supply, these special lines will be particularly emphasized in the instruction given, though sufficient practical work will be given in butter making to fit a few of the better qualified to take charge of creameries, a large number of which are found in the State. All instruction, as far as possible, will include both theoretical and practical work, and the text book and lectures will be illustrated in the cream-

ery, which is equipped with separators, churn and butter worker, and power and hand Babcock test machines are in daily use.

Separating cream from milk will be taught by lectures and by work with the two separators in the creamery.

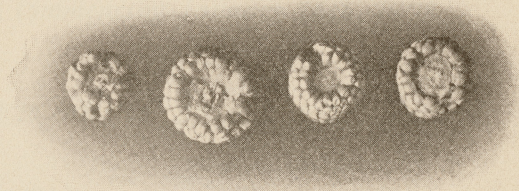
Ripening the cream and butter making will be taught by lectures, and the student will be required to do the churning sufficiently to become thoroughly familiar with the entire process.

Milk testing will be taught from text, and students will be thoroughly drilled in the use of the Babcock test.

Bacteriology will be taught from text, and all methods for producing thoroughly clean milk will be discussed.

Feeding the dairy cow will be taught by lectures.

Each student will be expected to provide himself with two white suits, which can be purchased at small cost.



In addition to the regular short course an apprentice course in dairying is offered, which has for its special object the preparation of boys to take charge of dairy herds, as there is a larger demand for such than we have been able to fill. These places usually pay much better wages than can be secured by the ordinary farm hand. The boys taking this course are expected to stay six months, and put in practically all of the forenoon, and an hour in the afternoon, milking, working with the dairy herd and making butter. They will receive instructions in the same subjects as the boys taking the short course in dairying, and to compensate them for their work their board and lodging will be furnished free, the only expense being for the two white suits, necessary bedding, and for washing. Boys over seventeen, and who know how to milk, are wanted, and all such applying

will be given preference in the order of their application. As only three apprentices can be accommodated at one time, it may be necessary for applicants to wait some time for their turn.

For further particulars address:

President R. W. Silvester,
Maryland Agricultural College,

College Park, Md.

Or

Director H. J. Patterson,
Md. Agrl. Experiment Station,
College Park, Md.

.....P. O.

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Dear Sir:

*I hereby apply for admittance to the Short Winter Course in.....
at the Maryland Agricultural College and Experiment Station, commencing January 16th, 1905.*

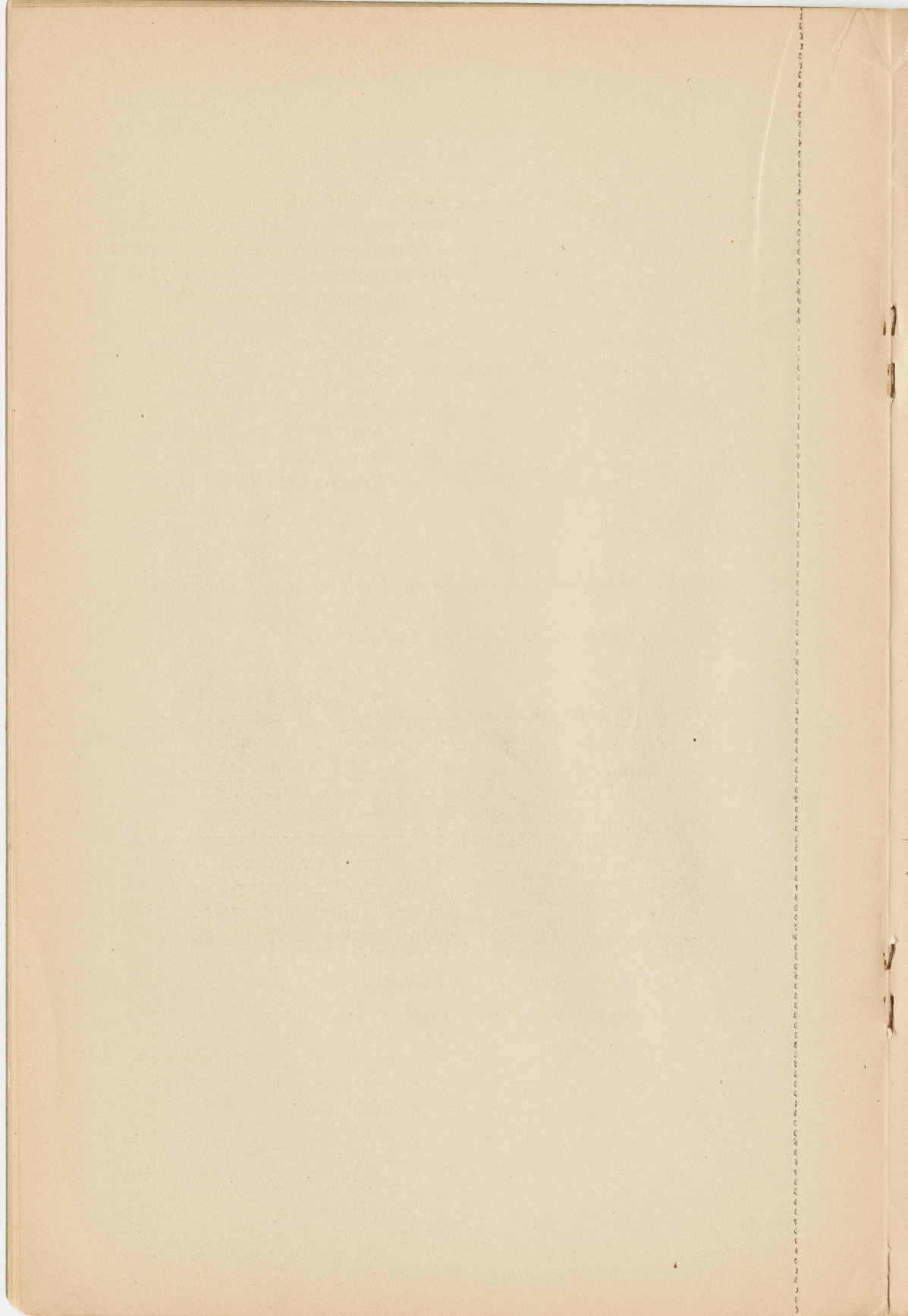
I expect to enter on.....

Name.....

County.....

President

*Maryland Agricultural College,
College Park, Maryland.*



LETTERS TO SCHOOL CHILDREN.

MARYLAND AGRICULTURAL COLLEGE,
OFFICE OF THE PRESIDENT,
COLLEGE PARK P. O., MARYLAND, DECEMBER 1, 1904.

TO THE CHILDREN:

I know that you are proud of your Country. This is as it should be. When you become men and women, I trust that your lives will make other children still prouder of your Country than even you are today! I know that you think that it is the greatest country in the world. Well! it is. It is great in its men and women, first; great in its natural conditions; great in the opportunities which these conditions afford; great in the ability of its young manhood



and womanhood to accept these opportunities and make the most of them. I fear that you do not fully appreciate the greatness of our division of your Country's activities—Agriculture. Many of you, no doubt, feel that the farmers have the hardest time—that their work is of little importance. In this, you are mistaken. Do you know that the farmers in this country, in the past two years, have

produced more wealth than all the gold mines of the entire world, since Colombus discovered America? That the value of the corn crop, alone, for one year will pay the national debt? That the hens around our houses lay eggs to the value of \$400,000,000, reckoning eggs at twenty-five cents per dozen! After feeding all the people, the live stock on the farms and in the cities of the United States, our farmers shipped to other countries, products of the farm to the value of one thousand millions of dollars. This not only helped the farmer, but was likewise a great help to the Nation, as well. So much for the Agricultural conditions of this great Country!

Our farms and farmers are the basis of our national safety. If you will study the principles of Agriculture and make it your business, as the doctor does his profession and the lawyer his, you will not only succeed, but your success will be attended by less risk, and your lives will be accompanied by more happiness, than you can find in any other vocation.

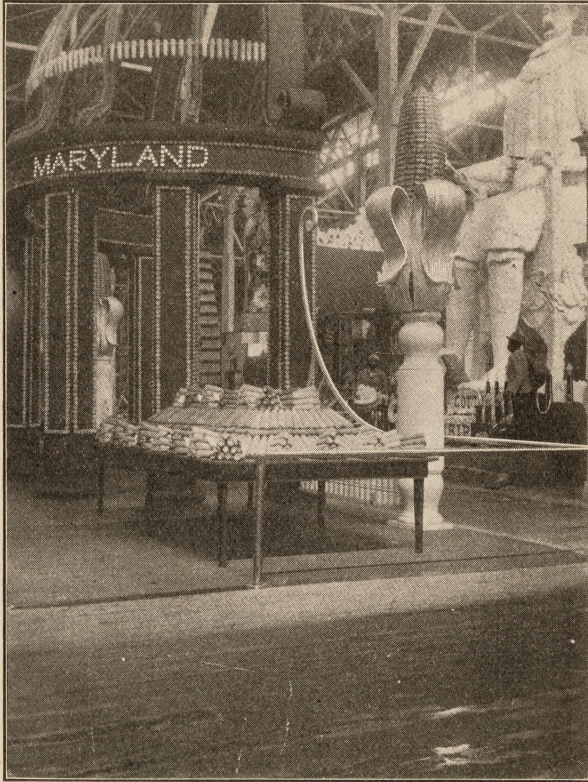
Should any of you wish information on any subject, write to us, as the little boy whose letter we publish in this Bulletin has done, and it will be a great pleasure to answer any query you may desire to make.

Let us now come home. What about "Maryland our Maryland" in this great work? Well! Maryland went to the St. Louis Exposition through her representatives. They did a great work for Maryland. I wish you could have been there to have seen our State Building, our exhibits of agricultural products and mineral resources. You would certainly have had sufficient reason for much increase in State pride. With only a small sum for the Agricultural exhibit, in comparison with other States, Maryland was awarded nearly one hundred prizes. Among these were two grand prizes, seventeen gold, twenty-eight silver and many bronzes. You must further remember, in addition to all this, the fact that at the World's Fair at Chicago, and at the Paris Exposition, Maryland corn received the highest awards, and this was repeated at St. Louis. How proud this should make you, and out of this pride should grow the resolve that when you become men and women this record will be maintained.

In view of these facts, you see that Maryland is no inconsiderable factor in America's greatness. We trust that you boys and girls

will take these statements *to heart* and feel a great pride in your country homes.

You can do much to beautify them. We hope in a future bulletin to give you some suggestions of how you can be helpful in this



Part of Maryland Corn Exhibit at St. Louis Exposition.

particular. Above you will find a small cut showing a view of one side of the corn exhibit at St. Louis.

R. W. SILVESTER,
President.

School Libraries.

NEW MIDWAY, MD., Dec. 2, 1904.

R. W. SILVESTER,
President Maryland Agriculture College,
Prince George's County, Maryland.

DEAR SIR:—

No doubt you will be surprised to receive a letter from me, for I am only eleven years old.

I go to school, and we have a very interesting book called "Agriculture for Beginners," by Charles William Burkett, and Frank Lincoln Stevens and Daniel Harvey Hill. These gentlemen tell us we can secure different bulletins from your Department by writing for them. As I am anxious to see them, I ask you, in behalf of my schoolmates, that you kindly favor us by sending by return mail bulletins on plant diseases and "Methods of making and using Bordeaux Mixture," "Smut Treatment and How to Use Formalin," as well as for information regarding other potato diseases.

By complying with the above request, you will oblige,

Yours respectfully,

(Signed) NORMAN PHILLIPS.

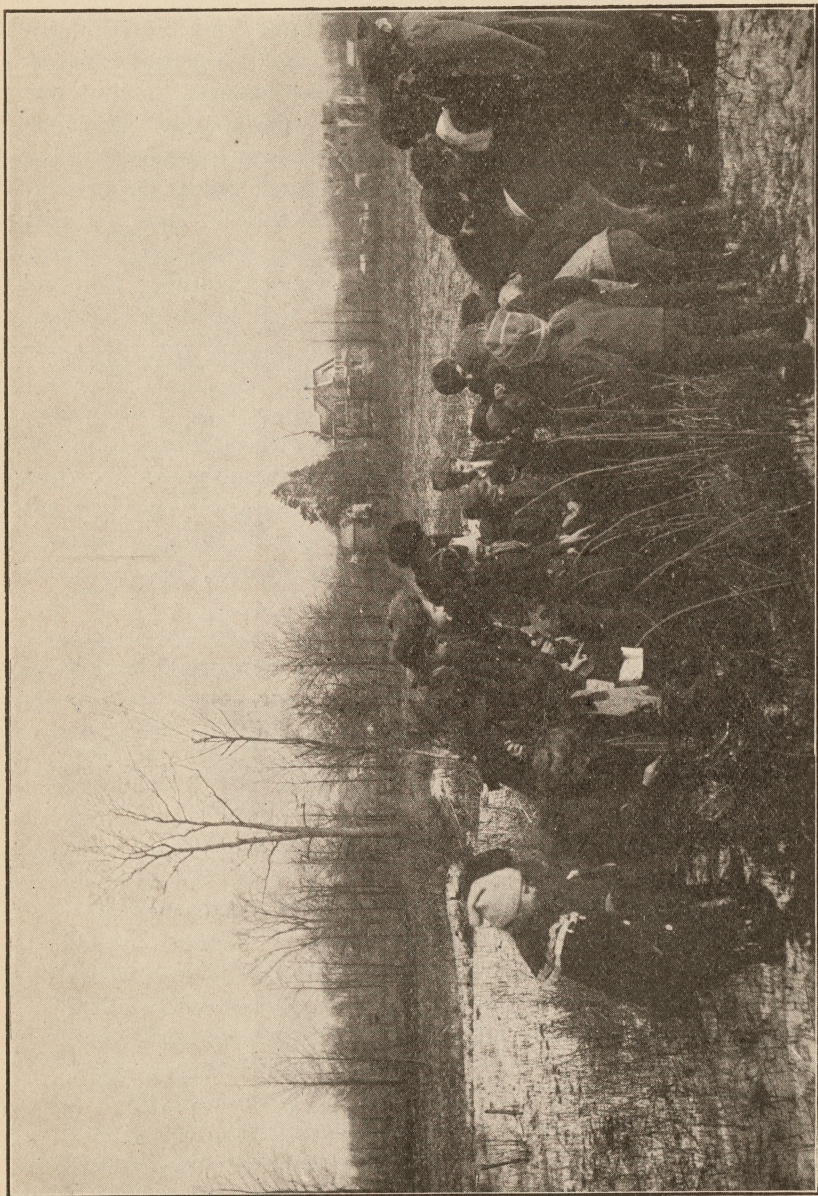
What a splendid thing it would be if every school in Maryland were teaching "Agriculture for Beginners," and to such interested pupils as the writer of the above letter! In a little while we should be seeing a great change in country life—an improvement which would add immensely to the happiness and welfare of everybody in our beloved State. That time will come, without a doubt. "Agriculture for Beginners," or some other good book for the primary study of Agriculture, will be taught in every country school, and in every school library there will be a shelf for books on Agriculture. It is so easy nowadays to get a good agricultural library that anybody can have one who will take the same means that Norman Phillips and his schoolmates are taking, that is to write for the books.

The Maryland Agricultural College publishes every year a number of valuable bulletins for free distribution. The Agricultural Experiment Station, at College Park, publishes many more, which are given free to all who send their names to Prof. H. J. Patterson, Director of the Experiment Station. The United States Govern-

ment spends millions of dollars annually in publishing bulletins giving the most valuable facts in agriculture, and these bulletins are sent throughout the United States, without charge, to any who write for them. All that is necessary is to write to the "Secretary of Agriculture," Washington, D. C., and ask him to put your name on the mailing list for publications of the United States Department of Agriculture. The Secretary will see that this is done, and then every month there will be sent you a list of the books and bulletins published by the Department during the previous month. You look over this and select such books as you think will be useful to you, and write again to the Secretary, asking him to send you those particular books, and he will do so with pleasure.

He has had the books or bulletins published for distribution, and it pleases him to see that people want the publications of his Department. On the list there will always be some books for which a small fee will be charged. If you want these books you can enclose the required amount, generally a very small sum, or you can usually get them sent to you, without any charge, by writing to your Congressman for it.

In this way every school would in a few years get together a very valuable library of Agricultural books, which would be of great use to teacher and pupils. Either the teacher could write or the children, as they did in the case of Norman Phillips, select one of their number to write.



A MARYLAND SCHOOL AT WINTER NATURE STUDY.

WINTER BOTANY FOR NATURE STUDENTS.

Prof. J. B. S. Norton.

In summer when we look out over the country nearly all that we can see is some kind of vegetation. A few bare roads or fields, a few rocks and houses, and perhaps ponds, rivers or other water; but by far the greater part covered with forests, cultivated field crops or weeds, and all of varying shades of green. As fall comes on the dying leaves take on the most brilliant of golden and red coloring which gradually fades into the richer and more luxuriant shades and finally dies into the browns and grays of winter. All the flowers are gone, the leaves are on the ground and everything seems dead, so we give them up and turn our thoughts to other things.

But they are not dead, and not always even sleeping, and if one can be inquisitive enough to look into their winter quarters or unkind enough to pull them out of their beds, the winter plants can tell as many interesting stories about themselves as they could in summer.

Winter is, however, a time of difficulty for all kinds of vegetation and for that reason is a most attractive period to the student of plant life; for whenever there are strong forces working against organic life, there will be found a great variety of adaptations to overcome them, which are not seen under conditions where life is easy. The many ways in which our wild plants continue their life through the winter or even grow during the warmer spells; the remains of dead plant structures of the past summer covering the ground and still retaining their characteristics, especially the grasses and larger herbaceous weeds and the leaves and fruit of trees; the exposed forms of trees, both in general outline and methods of branching, as well as bark characteristics; the general colors of the

landscape due to dead weeds and grasses and colors of twigs and branches of trees and shrubs not seen when all was covered with the more monotonous green of summer; the evergreen plants, and many other things give to the fields and woods in winter a charm for the naturalist which is doubly attractive on account of the rarity of life manifestations at this season.

Any well person, well clothed, can make a study trip of several hours through the woods with comfort and delight and his lunch warmed over an outdoor fire at this time is more delightfully appetizing after a tramp in the cold than it could be in summer. Enough, however, for ordinary school purposes can usually be found around the schoolhouse or homes, or in the parks in cities. More than twenty different kinds of plants can be found on any vacant city lot. A spade, small hoe or a strong trowel should be carried, for many of the most interesting things are now underground. A knife for cutting twigs, and if one wishes to bring in things for further study, a basket or box are necessary. A camera for photographing bark and outlines of trees and tree groups is a valuable help. A book for notes and drawings may be used outdoors, but numb fingers may make the pencil run with difficulty. If any drawing and writing descriptions is desired it can usually be done indoors.

How They Live Over Winter.

Some plants are able to live in the open all winter without the green leaves dying. This is the ideal time for hunting up the mosses and lichens which live attached to the bark of trees and on logs and rocks, and especially on the ground where the banks are shady and moist. Many mosses and lichen and even ferns and club mosses stay green and even grow in winter. Some of the mushrooms, especially the shelf-fungi, sometimes called "monkey benches," can be found on the sides of dead logs, and trees, but are usually dead. The evergreen trees, like pine and cedar and holly, are well known.



Fig. 1.—Lower part of a plant of *Hypericum* with part of old system, dead leaves and flowers above, living winter branches below with crowded leaves.

The higher plants that remain green usually acquire a more or less reddish tint in cold weather, and most of the remaining leaves lie close to the ground where it is warmer. The rosettes of leaves are sometimes so closely pressed to the ground that if they are taken up the leaves at once spring backward further. Of these evergreen herbs the mullen is interesting for its thick covering of felt-like hairs. Others are perfectly smooth. Often the cold weather keeps the leaves killed off at the tips, but a bud of young leaves remains at the centre. Some of the grass leaves keep growing up from below ground where it is warm and gradually die off above. Some of these evergreen herbs retain flower buds all ready to open, and if the temperature gets much above freezing, one can find dandelions and chickweed in bloom almost any winter month.

If we look at the base of the dead stems of some of our herbs that come up from the root in spring we may find a novel method of winter life. In the fall as the summer, fruit-bearing leaves and stems die, a cluster of branches and leaves of a different kind, usually smaller and thicker and lying close to the ground are produced. They will be found on some of the St. John's worts (fig. 1), galiums, etc., common in our fields. The thick, entire, hairy leaves of the Japanese honeysuckle which has become wild in Maryland and rambles in dense masses over the bushes along our fences and roadsides, offer a decided contrast to the thin, smooth, lobed leaves produced in spring.

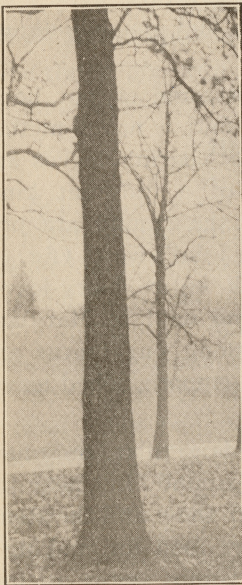
Another method which some plants have is similar, only here the low lying stems actually grow under the ground, but near the surface, and then the leaves are scale-like and they and the stems too, often, thickened with stored starch or other food for making a quick growth in spring, when they send their young stems up into the air (fig. 2). Our Irish potato plant is an extreme form of this where the stem structure and scale leaves are scarcely noticeable.

Many plants of the composite family as well as others have slen-

der underground stems with clusters of foliage on the end. Others have simply a cluster of buds at or below the surface on the base of the old stem.



The herbaceous plants like May-apple, wake-robin, Solomon's seal, etc., which make a rapid growth and bloom early in spring have now, deep underground a well formed bud with most of the parts to be produced in spring already in it in miniature, just as in the buds of trees enclosed in various forms of scales, there is tucked away ready for quick growth the whole branch that will develop in spring and early summer, and in the larger ones each leaf and flower as well as the little stem can be found by carefully taking them apart.



Dark colored, finely checked bark of black oak.

The Trees.

As we walk among the bare trees in the forest, even if we have never seen them before it is easy to pick out different kinds of trees and bushes. And the old woodsman can name each one at a glance. He knows them "by their faces" just as we know a personal acquaintance. We would have difficulty in describing our friends so others could recognize them in a crowd, but the marks are there and we have only to analyze them carefully enough to see what is the difference. With the trees it is much less difficult. In summer we

try to pick them out by the leaves, and flowers and fruits. In winter the first of these at least is of little help, for unless the tree is far from any other we do not know which the leaves that are lying on the ground came from. But look at the bark with its varying dark and light color, scaly, cracked, netted or smooth; the drooping branches, the general outline, the different kinds of buds and many other things. We need no other letter of introduction to our woody friends. (Figs. 3, 4, 5).

Things to Think About—What is the difference between black oak and persimmon bark? What trees still have the fruit hanging on them? Do any of the trees or shrubs have thorns? What kinds of vines live over winter? What are the little spots on the twigs? Can you tell how old a tree or branch is without counting the rings in the wood? Find some trees with the markings of bark running in rings around the trunk. What are the outgrowths on the sweet-gum branches? Do they occur on any particular side of the twigs? Are the pine and cedar leaves the same color now as in summer? Where is the largest tree you have ever seen? Probably it is older than this state or nation. That is worth thinking about, when you see in how short a time it could be cut down or burned up.

Tree Buds.

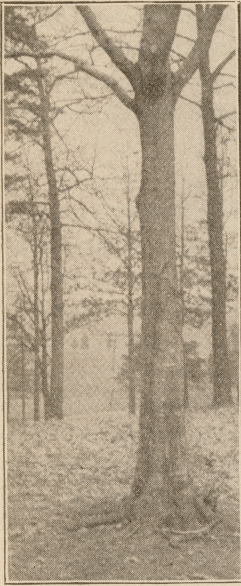
Much has been said in recent years about the winter buds of woody plants. It is always a fascinating study. The buds with their many kinds of scales; their number, shape and arrangement; the size, color and smoothness of the twigs give good means of identifying the different species. And the little scars where the leaves dropped off show more about the missing leaf than the finger prints do of the absent thief.

Things to Look Up.—When did the buds now seen first grow? Are the hairs in the bud scales of any use? Is there always a bud above each leaf? Was there a leaf below each bud? Take apart some of the larger buds of the tulip tree, or others that are well developed and find the little leaves folded up. The large maple buds will show rudimentary flowers.

Leaves.

Most of the leaves are lying on the ground dead, but some stay green all winter. Much has already been said of the living leaves

on a previous page. The dead ones often retain their shape enough to give a good clue to where they came from for several months.



Smooth, gray bark of beech. Various oak leaves on the ground.

Indeed some that have been covered up in the mud have been preserved for geological ages.

Problems.—Why do the leaves fall? Burn some of the dead leaves after weighing and see what proportion of them is ash, as compared with wood from the same tree. How did so much mineral matter get in the leaves? How many kinds of oak leaves can be found now on one hill? What kind of oaks keep the dead leaves on the tree? When do they drop?

Seeds.

The principal means that plants have of carrying their life over unfavorable periods like cold weather and drought is by the production of seeds. In winter the air is both cold and dry, and in the case of the annual plants, all parts of which die except the seeds, this is their one means of surviving.

Suggestive Questions and Exercises.—Are the seeds dryer than other parts of the plant? Is there a young plant in the seed waiting to develop when warm weather comes? Is it protected from cold in any way? How in different seeds? Where do the seeds of weeds spend the winter? Compare different kinds.

This discussion of winter Botany is intended only to furnish suggestions for teachers and pupils looking for subjects for winter

work. Almost any sentence in it might be elaborated into pages of details but that can better be done to fit each individual case.



Evergreen spire-shaped cedar in the centre, persimmon trees near it with irregular branches and roundish outline. On the left, poplar with slender ascending branches and on the right an oak with broad triangular outline, horizontal branches and dead leaves still hanging.

